

REMARKS

In response to the Office Action dated August 8, 2007, claim 1 is amended, and claims 9-12 are newly added. Claims 7 was previously cancelled. Claims 1-6, and 8-12 are now active in this application. No new matter has been added. The amendments to claim 1 are supported, at a minimum, by pages 5 and 8 and 9 of the specification, and FIG. 2. Note that new claims 10-12 are product by process claims.

Claims 1-6 are rejected under 35 U.S.C. § 103(a) for obviousness predicated upon Arimondi et al. (U.S. Pat. App. Pub. No. (2005/0072192, hereinafter "Arimondi") in view of Nagayama et al. (U.S. Pat. App. Pub. No. (2002/0059816, hereinafter "Nagayama") and Caplen et al. (U.S. Pat. App. Pub. No. 2003/0089133, hereinafter "Caplen"). Also, claim 8 is rejected under 35 U.S.C. § 103(a) for obviousness predicated upon Arimondi in view of Nagayama and Caplen and Kuwahara et al. (U.S. 2002/0174692). Applicants respectfully traverse both rejections.

Claim 1 recites, in part, "a second step of drawing the optical fiber preform in a drawing furnace to form an optical fiber having the air holes under conditions where an oxygen gas is present in the through holes, wherein **the oxygen gas suppresses the formation of SiO gas**; and a third step of heating the optical fiber to a temperature in the range of 900°C to 1300°C in an additional heating furnace provided downstream of the drawing furnace, such that **the bond of SiO that has adhered to the interfaces of the air holes is stabilized to decrease Rayleigh scattering at the interface and to decrease a transmission loss.**"

In order to establish a *prima facie* obviousness under 35 U.S.C. § 103(a), all the claim limitations must be taught or suggested by the prior art. *In re Rokay*, 490 F. 2d 981, 180 USPQ 580 (CCPA 1974). Further, “rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *In re Kahn*, 441 F. 3d 977, 988 (Fed. Cir. 2006). At a minimum, the cited prior art does not disclose (expressly or inherently) the above recited limitation.

The Office Action, at page 3, admits that Nagayama and Arimondi do not disclose oxygen gas in the through holes when drawing the optical fiber perform. The Office Action asserts that Caplen discloses oxygen gas in the through holes when drawing the optical fiber perform at paragraphs [0044] and [0045].

However, Caplen, at paragraphs [0044] and [0045], merely states:

[0044] In one embodiment, glass preform 70 is lowered into draw furnace 74 (see FIG. 5) for a sufficient time period to increase the gas pressure within annular passage 60 of glass preform 70. Glass preform 70 is then removed from within furnace 74. A negative pressure is applied to interior cavity 71 of inner handle 76 and interior cavity 69 of integral handle 58, thereby removing contaminants such as H₂O as well as other particulate matter. The interior cavity 71 of inner handle 76 and the interior cavity 69 of integral handle 58 are then backfilled with a dry or drying gas from a gas supply 84. **The gas can be a chlorine or fluorine containing gas, an inert gas, such as argon, helium, nitrogen, etc., and mixtures thereof. The gas may be intended to cause etching. If so, the gas preferably includes oxygen.** The supply of dry or drying gases is preferably provided so that if any gas enters annular passage 60 of preform 70, it is a clean dry gas that will not lead to attenuation induced losses within the resultant optical fiber.

[0045] Annular passage 60 of preform 70 is then opened by snapping bent tab 68 of preform 70. To snap bent tab 68, inner handle 76 is rotated relative to integral handle 58 such that breaking tab 80 of inner handle 76 engages bent tab 68 of preform 70 to break tab 68. Breaking bent tab 68 of preform 70 exposes annular passage 60 of glass preform 70 to gas within interior cavity 69 of integral handle 58, thereby reducing or eliminating possible contamination of annular passage 60 before drawing of optical fiber from preform 70. For example, exposing the annular passage 60 to gas inhibits wetting of the annular passage 60, i.e., the exposure of hydrogen species (e.g. H, OH, H₂O, etc.) to the surface of the

annular passage 60. While rotating inner handle 76 relative to integral handle 58 is preferred, integral handle 58 could be rotated with respect to inner handle 76. Further, both inner handle 76 and integral handle 58 could be rotated with respect to one another.

Paragraphs [0044] and [0045] disclose the existing of oxygen in the interior cavities 69 and 71 and before the drawing. However, we believe they do not disclose the existing of oxygen in the annular passage 60, which corresponds to the air holes of the present invention, or during the drawing, that is, after the perform 70 is lowered ([0047]), because the gas pressure within the annular passage 60 has been increased ([0044]) to reduce or eliminate possible contamination of annular passage 60 ([0045]).

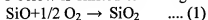
Thus, the oxygen gas of Caplen is merely intended to facilitate etching, and is **not used to suppress the formation of SiO gas**, such that **the bond of SiO that has adhered to the interfaces of the air holes is stabilized to decrease Rayleigh scattering at the interface and to decrease a transmission loss** as required by claim 1.

Thus, at a minimum, the combination of Arimondi, Nagayama, and Caplen fails to teach or suggest the forgoing limitation, and therefore does not render claim 1 obvious.

Even, for the sake of argument, all of the elements of claim 1 were disclosed by the cited art, there is no articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.

Moreover, the advantage of having oxygen present in the through holes during the drawing step is described in the present specification at page 8, lines 16-21 as follows:

Furthermore, oxygen gas is preferably present in the through holes 23 of the optical fiber preform 20. During drawing, SiO gas is generated in the through holes 23, as described above. However, the generation of the SiO gas can be suppressed because the equilibrium of Eq. 1 below is shifted to the right side as a result of the presence of the oxygen gas.



Thus, the presence of oxygen in the through holes 23 of the optical fiber preform 20, during drawing, advantageously suppresses SiO gas. The present invention addresses a particular problem attendant upon conventional practices of forming an optical fiber with air holes. That problem, as disclosed in the first full paragraph on page 2 of the written description of the specification, is a decrease in the transmission loss. In order to address that problem Applicants "conducted intensive studies" and found that the transmission loss is due to Rayleigh scattering at the interfaces of the air holes (paragraph bridging pages 4 and 5 of the written description of the specification). Claim 1 has been amended to emphasize the suppression of Rayleigh scattering.

After further studies, Applicants discovered the source of the problem, i.e., that when the microstructured optical fiber is removed from the drawing furnace and cooled, the produced SiO gas adheres to the interfaces of the air holes, and SiO is frozen before becoming stably bonded because the cooling rate of the optical fiber removed from the drawing furnace is 5000°C/second or higher (second full paragraph on page 5 of the written description of the specification). Applicants addressed and solved that problem by providing the method set forth in independent claim 1 which requires, *inter alia*, the use of an additional heating furnace subsequent to drawing, wherein the optical fiber is heated to a temperature range of 900°C to 1300°C.

It is well settled that the recognition of a source of a problem attendant upon conventional practices is, in itself, an indicium of nonobviousness. *In re Spinnoble*, 405 F.2d 578, 160 USPQ 237 (CCPA 1969). Secondly, it is well settled that the problem addressed and solved by a claimed invention must be given consideration as a potent indicium of nonobviousness. *Arimondi* does not envision the problem addressed and solved by the claimed invention. *North American Vaccine, Inc. v. American Cyanamid Co.*, 7 F.3d 1571, 28 USPQ2d 1333 (Fed. Cir. 1993); *Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 15 USPQ2d 1321 (Fed. Cir.

1990); *In re Newell*, 891 F.2d 899, 13 USPQ2d 1248 (Fed. Cir. 1989); *In re Nomiya*, 509 F.2d 566, 184 USPQ 607 (CCPA 1975).

Based upon the foregoing it should be apparent that a *prima facie* basis to deny patentability to the claimed invention has not been established for lack of the requisite realistic motivation. Moreover, upon giving due consideration to the potent indicia of nonobviousness of record, stemming from Applicants recognition of the source of a problem attendant upon prior art practices, and the failure of the reference to even envision the problem addressed and solved by the claimed invention, the conclusion appears inescapable that one having ordinary skill in the art would not have found the claimed subject matter as a whole obvious within the meaning of 35 U.S.C. § 103. *In re Piasecki*, 745 F.2d 1468, 223 USPQ 785 (Fed. Cir. 1984).

Thus, Applicants submit that claim 1 is allowable over the cited art.

Under Federal Circuit guidelines, a dependent claim is allowable if the independent claim upon which it depends is allowable because all the limitations of the independent claim are contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819 F.2d at 1100, 1108 (Fed. Cir. 1987).

Thus, as independent claim 1 is allowable for the reasons set forth above, it is respectfully submitted that dependent claims 2-6, and 7-12 are allowable for at least the same reasons.

Further, dependent claim 9 recites, in part, “wherein the through holes are **not etched**.” Note that Caplen, at paragraph [0044] states, “The gas may be intended to cause etching. If so, the gas preferably includes oxygen.” Therefore, Caplen teaches away from claim 9.

Also, dependent claim 11 recites, in part, “the air holes are arranged in a **hexagonal pattern**.” None of the cited art discloses this limitation.

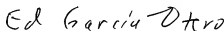
Thus, dependent claim 9 and dependent claim 11 are also allowable for the above additional reasons.

Based upon the foregoing it should be apparent that the imposed rejections have been overcome and that all pending claims are in condition for immediate allowance. Favorable consideration is, therefore, solicited. If there are any outstanding issues which might be resolved by an interview or an Examiner's amendment, the Examiner is invited to call Applicants' representative at the telephone number shown below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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